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A Study of the Effect of Stress upon Performance on a Measure of Creative Potential

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A STUDY OF THE EFFECT OF STRESS UPON PERFORMANCE ON A MEASURE OF CREATIVE POTENTIAL

by

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LIFE

Joseph Rizzo was born in Chicago, Illinois on November 24, 1942.

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CHAPTER I

PURPOSE

In a recent article entitled "Originality," Norman Mackworth (1965) proposed the idea that in our contemporary technological world problem-solving is no longer the most crucial issue demanding scientific attention. The mass employment of computer techniques in the solution of problems has made this process essentially a mechanical one, or at least a process more efficiently handled by machines. More important currently is the process of problem-finding! "Indeed the greatest contribution that can be made nowadays is to formulate new and testable ideas; the scientist who does not speculate is no scientist at all....The rate at which discoveries are made now depends more than ever on the number of people who can formulate important research problems (Mackworth, 1965)." Mackworth envisages a more or less imminent "idea lag" in which a lack of challenging problems and ideas will create a bottleneck in the advancement of knowledge. While this argument

may at first seem somewhat farfetched, the current flurry of interest and publication in the area of creativity suggests that Mackworth is by no means alone in his concern.

In fact, a steadily increasing volume of research and speculation regarding originality and creativity supports the contention that the identification, encouragement, and development of the creative individual--the problem-finder--is an area urgently requiring intensive investigation. But it is also a fact that this urgency is only slowly being recognized even though the creative process has long been subject to casual speculation.

It is the purpose of the present investigation to make some contribution to current understanding of the creative individual by exploring the relationships between creativity and a potentially crucial personality variable, anxiety.

CHAPTER II

REVIEW OF RELATED LITERATURE

Although creativity has been a matter of psychological concern at least since the statements of the early psychoanalysts on sublimation (Freud, 1930, 1933, 1947; Sachs, 1951), the scientific study of this process has been sporadic, at best, until recent years. After Freud had formulated the concept of sublimation as the process underlying creativity, a few other analysts modified and extended his approach. However, these discussions remained largely in the realm of speculation and clinical inference. Thus, in an extensive review of the literature on creativity, Hutchinson (1931) was confined almost entirely to material from literature and the arts, with psychological discussions being more or less incidental. Somewhat later Markey (1935) was able to report more systematic investigations of imagination using inkblots and problems requiring novel solutions, presaging most modern approaches. Yet, no really direct attack on the problem of creativity was made for at

least another fifteen years.

In 1950 J.P. Guilford announced a plan for the comprehensive investigation of the human intellect. A systematic study of creative potential was to be part of this undertaking. At that time Guilford described the factor analytic approach to which he has subsequently adhered in his experimentation. Defining personality as a pattern of traits, Guilford hypothesized a number of specifically creative traits, described possible exploratory tests, and defined his investigatory population quite broadly by assuming that creative acts--though perhaps "feeble or infrequent"--could be expected of almost all normal people.

Guilford immediately began to implement his research program. Defining originality in terms of statistical infrequencies of responses, Guilford devised a number of measures to test his hypotheses (Guilford, 1951). To date well over fifty such tests have been developed and used for preliminary exploration of the following hypothetical factors: word fluency, ideational fluency, flexibility of thinking, originality, redefinition, and elaboration (Golann, 1963; Hoepfner and Guilford, 1965). Most of these instruments have remained at an experimental level and have not been standardized

(Guilford, et.al., 1952, 1954, 1956a, 1956b, 1957, 1963a, 1963b; Merrifield, et.al., 1963). However, a few of these tests have been standardized, published, and subsequently employed by other investigators. Among the more widely used of these tests are Word Fluency, Ideational Fluency, Alternate Uses (formerly Brick Uses), and Consequences. Because its development is representative of the evolution of most of the tests devised by Guilford and his associates at the University of Southern California since 1950, and because it is employed in the present investigation, the standardization of Consequences will be described briefly.

From the earliest uses of experimental forms of Consequences, this test has had a consistently substantial correlation with the hypothesized factors of originality and ideational fluency (Christensen, et.al., 1958). Consequences requires subjects to produce the possible results of a number of hypothetical occurrences of a calamitous nature. Responses are scored both in terms of quantity and quality (as obvious and remote respectively). Tests of this type have been employed in the investigation of creativity because the authors feel that "in the assessment of creative abilities...there seems to be no escape from the use of open-end items,

with subjective scoring of responses (Christensen, et. al., 1958)."

Reliability data for Consequences was obtained from samples of ninth grade students and from samples of young adult males (Christensen, et.al., 1958). Mean corrected alternate-forms reliability coefficients for the ninth grade samples were .87 and .67 for the obvious and remote scores respectively. Mean reliability coefficients for the young adult male sample were .86 for obvious scores and .82 for remote scores, again based on alternate forms.

Construct validity for Consequences is presented in terms of factorial loadings. Validity studies employed the samples mentioned above with these results: the obvious score yields validity coefficients of .54 and .62 for the measurement of the factor of ideational fluency in the ninth grade and young adult populations respectively. The remote score has a mean validity coefficient of .42 for the measurement of originality in the young adult sample but has a higher factor loading on spontaneous flexibility in the ninth grade sample. This latter finding suggests that two different creativity factors are operating in the adolescent and adult samples. This difference in loadings is explained

by the authors in terms of different operative strategies among the two groups.

Measures of other creativity factors devised by Guilford and his associates have, in general, yielded similarly promising construct validity and have, in addition, suggested possible personality correlates of creativity (Guilford, et.al., 1957; Merrifield, et.al., 1963).

Though he has certainly led the way in the scientific study of creativity, Guilford is by no means alone in his interest in this area. Barron, for example, has published extensively in the area of the experimental investigation of creativity, though his work has been more generally directed toward the investigation of personality correlates of creativity.

In a study of 100 U.S. Air Force captains, Barron (1955) used some of the Guilford measures (Unusual Uses, Plot Titles, Consequences) as well as other tests, including clinical interviews and performance in the Asch line situation to establish high and low creative groups. Barron required, as criteria of originality, that test responses be: a)infrequent in the population of responses to which they were compared, and b)adaptive to reality. Correlations between tests and interview

ratings of creativity as well as performance in the Asch line situation suggested that "originals" are more assertive and dominant than less creative individuals. Further, they reject suppression as a mechanism for the control of impulses. On the basis of this and other investigations (1952, 1953, 1958a) Barron concludes (1958b) that the creative individual respects the irrational and unconscious in himself, and that he is optimistic regarding his capacity to impose order upon complexity. The creative person, further, can admit repressed material to consciousness and permit impulse expression and regression because of his confidence in his capacity for ego control. Whether one likes the analytically flavored terminology Barron uses or not, his conclusions seem to point strongly toward more cognitive flexibility, and less anxiety and defensiveness in creative than in less original individuals.

Following Guilford's lead, other investigators have begun to study creativity empirically. Chorness (1956) employed Guilford's creativity tests on a sample of air force trainees. He used as his criterion instructors' ratings of students on various attitudes including the ability to transcend rote material and originality of expressions. With the effects of intelligence partialled

out, Chorness' findings indicated that the creativity tests alone could carry the burden of criterion prediction, and that the best single predictor of criterion attainment was a test of controlled associations (generally the type of task required in Guilford's tests).

In a study of high school students Cline, Richards, and Clifford (1962) attempted to predict academic performance from a creativity battery. They administered Guilford's Consequences, Word Association, Hidden Figures, Brick Uses, and Match Problems tests to a sample consisting of 95 males and 66 females. In addition, all subjects were given the California Mental Maturity Inventory as a measure of intelligence. The results of this investigation indicate that creativity tests do have considerable validity as predictors of academic performance. Even more significant, they further concluded that criterion variance accounted for by the Guilford tests is "to a substantial degree independent of the criterion variance accounted for by IQ tests." These findings suggest that Guilford's creativity battery is measuring factors not fully represented in the IQ.

In a government sponsored study, Drevdahl (1961) supported the contention that, given a certain minimum intellectual level, creativity may be more dependent

upon personality factors than upon intelligence, offering the work of Stein, Cox, Barron, Roe, and Cattell as evidence for this belief. Drevdahl attempted to determine some of the more important of these characteristics. Ten psychologists were asked to submit a list of psychologists they considered to be creative. Names submitted independently by at least three of the judges were included for study, yielding a final sample of 228 creative psychologists, so judged by their peers personally acquainted with their work. These 228 subjects then rated each other on a 3 point scale of creativity, rating only those with whose work they were familiar. Subjects were further asked to complete Cattell's 16 Personality Factor Questionnaire and Cattell's Motivational Analysis Test, and they participated in interviews. On the basis of data gathered by means of these devices subjects were divided into 4 groups: creative (C); non-creative, non-productive (NCNP); non-creative, productive (NCP); combined control (CC). Subjects in the C group were found to be more skeptical and inquisitive than other groups. They showed fewer signs of neuroticism and had less formally structured college and graduate training. Creative subjects also exhibited fewer feelings of insecurity and social inferiority than NCNP or CC.

Finally, creative subjects manifested less concern with authority and sex than other groups (a finding, incidentally, which fits neatly with the psychoanalytic concept of sublimation). On the basis of his findings Drevdahl concluded that self-acceptance and tolerance are desirable for creativity. Further, creative individuals are less insecure and anxious than others, particularly those who are neither creative nor productive.

A study by McPherson (1959) of technical employees of the Dow Chemical Company presents further support for the conception of personality variables as being important in creativity. McPherson found significant differences in anxiety level (based on Welsh's MMPI A-index) between creative and released (fired) groups, inferring that released employees were more anxious and therefore gave significantly less play to primary process modes of thought than creative individuals.

Once more using Guilford's tests as a criterion, Merrifield, Gardner, and Cox (1964) found that, among seventh grade children, tolerance of ambiguity, a sense of humor, and non-conformity are related to creativity in some non-chance way.

Pine and Holt (1960) and Pine (1962) also employed Guilford's Brick Uses (Alternate Uses) and Consequences

tests, this time in conjunction with Rorschach's and TAT's. The tests were administered to 50 unemployed actors, 13 male undergraduate college students, and 14 female undergraduates. Their results indicated a significant rank correlation between the Rorschach--when scored for primary process and adaptive regression--and Brick Uses and Consequences, the coefficients being .48 and .74 respectively.

VanZelst and Kerr (1954) administered a self-description rating scale to over 500 technical and scientific personnel of the Armour Research Foundation, categorizing subjects into creative and non-creative groups with productivity as the criterion. These investigators found that more productive workers rated themselves as more original, curious, impulsive, and less formal and inhibited as compared to the self-descriptions of less productive workers.

Wild (1965) similarly describes creative individuals as exhibitionistic, curious, and inner-directed. In one of the few experimental investigations of creativity Wild asked groups of art students, teachers, and schizophrenics to take word association, and object sorting tests under spontaneous instructions and instructions designed to induce regulated and unregulated thought.

Subjects were also required to take the Rorschach and to complete a questionnaire asking for reactions to the inkblots. Wild found that with spontaneity instructions there is some tendency for art students to be more original than schoolteachers or schizophrenics, and that they can engage in unregulated thinking with more facility and pleasure than the other groups. Further, the art students expressed more enjoyment of the Rorschach and seemed to give original responses qualitatively different from the other groups. According to Wild, "these findings are all consistent with the concept of regression in the service of the ego...." Such controlled regression implies a freedom from anxiety involved in the primitivization of thought and a confidence in the ability of the ego to control the primitivization. Thus, as Kris (1952) views the matter, the creative individual possesses a flexibility of repression and is distinguished from the psychotic in that he is not overwhelmed by primary process and is capable of sublimating. Bellak (1958) offers some modification of Kris's original formulation, suggesting that, while cognitive functions are allowed to regress, synthetic functions are not. Thus adaptive regression is a brief, relative reduction in conscious control and is, in this way, distinguished from psychotic

primitivization. Schneir (1960) puts the matter still differently, relating creative content to the id, while form is an ego-derived element. Consequently, it is form or the control of id material by the ego which differentiates creativity from mere catharsis.

Quite recently S.A. Mednick (1962, 1964) has approached the study of creativity by means of a Remote Associates Test which requires subjects to supply a word which will associate a triad of otherwise unrelated words. For example, given the words high, electric, and wheel, the response, "chair" would be a unifying associate.

Underlying this approach is the belief that the ability to form and employ novel associations is the basis of creativity. However, a systematic investigation of the personality correlates of creative behavior has not yet been initiated by Mednick. A recent test of this associative conception of creativity (Reigel, Reigel, and Levine, 1966) suggests that "it is inappropriate to restrict an interpretation of creativity to the most elementary associative processes (p.55)." Reigel, Reigel, and Levine offer an alternative conceptualization in terms of a computer analogy. They view the creative process as one of recoding input into chunks, programming this coded information into various interconnected

classes and decoding it appropriately as a creative response. This is, perhaps, the most novel employment of computer simulation, and a potentially fruitful one.

By way of summary, the experimental literature seems to indicate that creativity may not be as contingent upon intelligence as is commonly thought (Meer and Stein, 1954, 1955; Chorness, 1956; Drevdahl, 1961; Cline, et. al., 1962). Also, creative individuals have rather consistently been described as being more impulsive, imaginative, individualistic, independent, and tolerant of ambiguity and uncertainty than less creative persons; at the same time they are less neurotic, compulsive, anxious, and inhibited (Barron, 1953, 1958; VanZelst and Kerr, 1954; Guilford, et.al., 1957; Guilford, 1959; Drevdahl, 1961; Getzells and Jackson, 1961; Levy, 1961; Rees and Morton, 1961). Finally, there seems to be some support for the contention that creativity is a continuous variable, present in almost all normal people at least to some minimal extent (Guilford, 1950; Wilson, et. al., 1953; Levy, 1961; Maslow, 1962).

From a theoretical standpoint, current knowledge about creativity and creative persons seems adaptable to a number of conceptualizations.

First of all, there seems to be a rather general

agreement as to the considerable importance of unconscious processes. The psychoanalysts speak of sublimation and, today, even more widely of primary process thinking and adaptive regression. These concepts have been described earlier as referring to the ability of the individual to regress to primary process modes of thought while yet maintaining control of the regression and using it to attain a more complete contact with reality. Maslow (1958) seems to have adopted a quite similar viewpoint. Maslow distinguishes between primary and secondary creativeness. Primary creativeness comes out of the unconscious and it is the source of play and fantasy as well as originality. Secondary creativeness, on the other hand, is a kind of rational productivity. Creativity is blocked when access to primary process material is impeded. For example, the requirements of social adjustment may interfere with creativity by demanding the repression of particular impulses or modes of thinking. More recently Maslow (1958) has described what he calls "self-actualizing creative" individuals who are characterized by their relative absence of fear of others' and their own impulses, emotions, and thoughts, and who exhibit greater self-acceptance. Finally, Barron (1958) also emphasizes the importance of unconscious and irrational

processes in creativity.

Christensen, Merrifield, and Guilford (1958) offer an alternative conceptualization, suggesting that probably "the same idea (adaptive regression) is expressed in more scientifically manageable terms by saying that the creative person 'has ready access to his memory storage.'"

Departing from popularizations, theorists also agree that the creative person is in no way neurotic or abnormal. The truly creative are usually described as having greater ego-control, less reliance upon impulse suppression, less anxiety and insecurity than non-creative persons (Maslow, 1958, 1959, 1962; Barron, 1953, 1958; Guilford, et.al., 1957; Levy, 1961; MacKinnon, 1962; Kubie, 1961).

On the basis of the above widespread theoretical and empirical agreements it seems reasonable to hypothesize a relationship between anxiety and creative performance either in life situations or in a laboratory setting. Furthermore, authorities in the field repeatedly suggest that the relationship is an inverse one, with anxiety and defensiveness inhibiting the actuation of creative potential. This may be because anxiety impedes associations; it may be due to interference with access to memory storages because of conflicts in the priority of

programs to be employed by the organism; or it may be because anxiety actually elicits defensiveness and blocks access to preconscious and unconscious material. It is not the purpose of this particular study to adduce support for one theoretical position. The problem is rather to test--by experimental rather than correlational methods--the existence and effects of a frequently observed relationship between anxiety and creative potential. However, the theoretical assumptions and constructs as well as the empirical data offered by any of these positions are amenable to the present design.

Also, it seems legitimate to employ tests of creative potential as a sample of a particular type of behavior in a standardized situation (Wilson, et.al., 1953), inferring a possible general potential from such a sample. In one sense such an approach is more limited than the use of personality and product ratings by observers. At the same time, however, a test approach does have the advantages of greater objectivity and broader standardization. The rather predominant employment of a test approach in the study of creativity supports the contention that tests are valuable in this area.

CHAPTER III

PROCEDURE

SAMPLE

Subjects for this study were chosen from a population of freshman college students at Loyola University enrolled in Psychology 101 classes. Such limitation of the sample automatically provided a rough control of intelligence and educational background. Random assignment to groups further controlled these factors.

Prior to selection all subjects had been administered the Taylor Manifest Anxiety Scale and the Nicolay-Walker Personal Reaction Schedule (PRS) (Walker and Nicolay, 1963; Walker, Neilsen, and Nicolay, 1965). Subjects were then selected according to scores on the PRS. Specifically, subjects with scores (rounded to the nearest whole number) at least one standard deviation above the normative mean (Walker and Nicolay, 1963) were designated high anxious. Those with rounded scores at least one standard deviation below the normative mean were designated low anxious. A further division

was then made into control and experimental groups, with subjects being assigned randomly.

Thus, finally, there were 4 groups: high anxious experimental (HAE); low anxious experimental (LAE); high anxious control (HAC); and low anxious control (LAC). Each group consisted of 10 subjects yielding a total N of 40. Although originally, it was intended that N be larger, difficulties in securing subjects with suitable scores forced a reduction in N. As will be evident later, the size of N proved to be the major defect of this study and probably served to obscure important relationships.

VARIABLES

The independent variable in this study was stress induction defined operationally according to the experimental instructions. The dependent variable was performance on Consequences (Christensen, et.al., 1958), one of the tests in Guilford's creativity battery. Consequences, which has substantial loadings on the factors of originality and ideational fluency was used alone rather than in a complete battery to make the results more unitary and meaningful (on the basis of a suggestion by R. Hoepfner, Assistant Director of the University of Southern California Aptitudes Research

Project). Consequences consists of 10 open end items with 2 minutes of working time per item. Subjects are required to specify as many results of some hypothetical catastrophic event as they can within the time limit. As pointed out earlier, normative data on Consequences has been gathered from samples of elementary, high school, and college students, and from marine officers (Christensen, et.al., 1958). In addition to the factorial research of Guilford and his associates, Consequences has been employed by a number of other investigators with indication of utility in assessing creative potential (Barron, 1955; Chorness, 1956; Cline, et.al., 1962; Pine, 1962; Garwood, 1964).

METHOD

High and low anxious control subjects (HAC, LAC) were individually given Consequences according to standard instructions and were strictly timed. No comments were made by E regarding performance during the administration. Questions were answered by a repetition of the appropriate part of the instructions.

Originally, it was intended that for experimental subjects stress would be induced by threat of electric shock rather than by actual shock. However, during pre-experimental trials, it was found that subjects quickly

realized that no shock was forthcoming. Consequently, the procedure was altered to involve actual shock.

High and low anxious experimental subjects (HAE,LAE) were given the following instructions.

> The purpose of this study is to standardize a new and different test to be used for a final screening of incoming freshmen who have had marginal scores on other tests. In order to maintain a level of motivation as high as these people might have, a mild electric shock will be administered if your performance does not approximate the norms we have developed so far. However, before being shocked you will always be given a prior warning with a buzzer like this (demonstrate) so that you may have a chance to improve your performance and avoid the shock. In other words, the sound of the buzzer will warn you when your performance is becoming poor and shock is likely to come. Do you understand?

Subjects were then given standard instructions for Consequences. Warnings, in the form of buzzer soundings were given twice during each of 5 randomly chosen items, but always including the first item. All warnings were followed by a shock (on the Harvard Inductorium) within 3 seconds. Shock level was controlled in the following manner. Prior to beginning, a series of 3 to 5 shocks was administered to each subject, becoming increasingly stronger from first to last. When the subject reported that the shock was "uncomfortable but not painful" it was assumed that a level of tolerance had been reached.

At this point an incrase of one half centimeter on the Inductorium was made to insure the unpleasantness of the shock.

CHAPTER IV

RESULTS

Tables I through IV present the means and standard deviations for the 4 groups (HAE, LAE, HAC, LAC) on each of the variables investigated. It is apparent from these tables that, expectably, there was relatively little variability within groups in terms of total anxiety scores (MOP, MAS) or in terms of the subfactors of the PRS (anxiety types M, O, P). However, a comparison of standard deviations on the dependent variables (O-obvious, R-remote, OR-total) among the 4 groups immediately reveals that the experimental condition had a differential effect on subjects raising the variability of scores on the creativity test. In fact, overall variability of dependent variable scores under the experimental conditions was over 50% greater than under control conditions. This finding, of course, suggests the presence of unanticipated and unidentified confounding variables involving different modes of reaction to the experimental shock even within groups. In other words, it seems that shock inhibited some subjects while simultaneously

stimulating others to better performance.

Table V is a summary of a 2 X 2 analysis of variance of variable OR. The results of this analysis indicate that there were no significant main effects or interactions among the variables. Consequently, the hypothesis of an inverse relationship between anxiety and creativity remains unsupported on the basis of this study. It must be kept in mind, however, that lack of significance is probably due to the fact that N was small, preventing the emergence of clearcut relationships. Since at least two of the F-ratios approach significance, it seems likely that an increase in N would have altered the picture considerably.

Tables VI through IX summarize the correlational computations for all variables within each of the 4 groups. It is apparent that the majority of the correlations between anxiety and creativity scores are not significant under either experimental or control conditions. It is possible that those correlations which are significant may have been due to chance, but in view of the small N this is highly unlikely. What is more, the combination of a small N and the fact that subjects were selected (reducing overall variance) suggests that those correlations which are significant are quite important.

Consequently, it would be worthwhile to summarize the correlational findings with a view toward speculating on their possible meaning.

In the HAE group there are significant negative correlations (at the .05 level) between type M anxiety and O, between type M and OR, between MOP and O, and between MOP and OR. In the first place, all these negative correlations were predicted in terms of the hypothesis that anxiety would be negatively correlated with creativity under stress conditions. More specifically, it is also reasonable that type M anxiety (see Appendix for a summary of anxiety type descriptions) interfered most significantly with the production of obvious responses on Consequences since this type of anxiety results in hyperactivity and physical and mental restlessness, both of which would inhibit the rapid production of responses. This, in turn, would lower the overall creativity score. In other words, the diversion of energy into physical channels would inhibit the concentration of the subject on the rapid production of responses.

In the LAE group there were no significant correlations between the anxiety scores and the creativity scores. One might speculate here that the relative absence of anxiety was a condition which at least did not significantly

inhibit response production even in the presence of stress. In fact, it is possible that shock served as a spur to better performance among at least some of these subjects.

In the HAO group we find significant negative correlations between type O anxiety and obvious scores and between type P anxiety and obvious scores. In contrast to the HAE group, type M anxiety is absent, probably reflecting the absence of an external physical stress condition as an important variable. Instead, type O anxiety seems to reflect difficulties arising with the task as a simple result of the demands made upon the subject. Similarly, type P anxiety would reflect more intropsective aspects of the same situation. It would be well to clarify a point here. The implication of the relationship between anxiety types and the experimental condition is not that the condition stimulates a particular anxiety type; rather, subjects predominant in different anxiety types react differentially to a given condition, giving rise to significant correlations. In other words, it seems as though both concern with the external demands of the situation and concern with the resultant reflection on personal adequacy were important factors in the absence of stress and they consequently inhibited a concentration of energy on the task at hand,

acting as a detriment to efficient performance.

Finally, in the LAC group, the only significant correlations were those between type O anxiety and the remote and overall creativity scores. This finding suggests that subjects relatively higher in type O anxiety, while not significantly inhibited in the production of obvious responses, were unable to operate efficiently in the face of the more demanding task of producing remote responses.

In summary, then, it seems that generally anxiety did correlate negatively with creativity when the correlations were significant. More specifically, subjects high in type P anxiety seemed most susceptible to the disorganizing effects of the stress condition. On the other hand, the absence of significant correlations between stress and creativity scores among the LAE subjects reflects some capacity for controlling and channeling drive or energy and operating relatively efficiently despite stress. Even in the absence of shock high anxious subjects seem to view a demanding task as a possible reflection of personal adequacy, with the demands of the task themselves serving to produce some disorganization and inhibition of efficiency. This is indicated in the negative correlations between type O and type P anxiety and the creativity scores

in the HAC group. Finally, there is the negative correlation in the LAC group between type O anxiety and remote responses and overall creativity. While this result does not easily fit with the general ideas outlined, it is possible--as generally suggested in the Hull-Spence approach--that some anxiety facilitates efficiency. Thus the stress in the LAE group served to stimulate better performance than that found in the LAC group.

It now remains briefly to examine the meaning of some of these correlational findings in relation to the earlier mentioned theoretical positions. First of all, to restate what has been said, this study does indicate some negative relationship between anxiety and creativity and between stress and creativity, even though an analysis of variance failed to reveal significant main effects or interactions. This relationship has not been experimentally demonstrated previously.

In a general way these findings lend support to the contention that anxiety acts to inhibit the actuation of creative potential. One could neatly relate these ideas to the concepts of adaptive regression or that of primary creativeness. A more promising approach, however, at least from a scientifically investigable standpoint, is

that anxiety is related to creative performance in a curvilinear fashion, just as it is to learning and motor performance. Thus, a low level of anxiety seems to facilitate performance. High anxiety inhibits efficiency. Low anxiety in combination with some stress produces even better performance, with the stress apparently raising drive to some sort of optimal level. High anxiety in combination with stress produces just the opposite effect so that under these conditions performance seems to suffer most.

At this point, therefore, there seems to be no need to turn to the somewhat nebulous ideas of adaptive regression or primary creativeness. An approach oriented toward learning theory and problem-solving provides a usable point of departure for the further investigation of creativity and creative individuals.

TABLE I

HIGH ANXIOUS EXPERIMENTAL GROUP
MEANS AND STANDARD DEVIATIONS FOR THE DIFFERENT VARIABLES

VAR.NAME	N	MEAN	STD.DEV.	SUM X	SUM X^2
M	10	15.20	2.666	152.0	2374.0
O_1	10	15.60	3.146	156.0	2522.0
P	10	19.00	2.366	190.0	3660.0
MOP	10	49.50	6.387	495.0	24869.0
MAS	10	29.30	4.632	293.0	8777.0
O_2	10	47.60	18.011	476.0	25576.0
R	10	17.60	7.270	176.0	3572.0
OR	10	65.20	21.842	652.0	46804.0

M.....Anxiety type M
O_1....Anxiety type O
P.....Anxiety type P
MOP...Personal Reaction Schedule total
MAS...Manifest Anxiety Scale
O_2....Consequences, obvious score
R.....Consequences, remote score
OR....Consequences, total score

TABLE II

LOW ANXIOUS EXPERIMENTAL GROUP
MEANS AND STANDARD DEVIATIONS FOR THE DIFFERENT VARIABLES

VAR.NAME*	N	MEAN	STD.DEV.	SUM X	SUM X^2
M	10	4.80	2.054	48.0	268.0
O_1	10	3.70	1.843	37.0	167.0
P	10	4.40	1.744	44.0	220.0
MOP	10	12.90	3.728	129.0	1789.0
MAS	10	5.30	3.645	53.0	399.0
O_2	10	57.70	22.289	577.0	37763.0
R	10	23.60	13.950	236.0	7320.0
OR	10	84.00	32.331	840.0	79968.0

*See Table I for explanations of variable name abbreviations.

TABLE III

HIGH ANXIOUS CONTROL GROUP
MEANS AND STANDARD DEVIATIONS FOR THE DIFFERENT VARIABLES

VAR.NAME*	N	MEAN	STD.DEV.	SUM X	SUM X^2
M	10	16.80	2.931	168.0	2902.0
O_1	10	12.90	3.049	129.0	1747.0
P	10	15.90	2.387	159.0	2579.0
MOP	10	45.60	1.974	456.0	20828.0
MAS	10	28.60	7.970	286.0	8750.0
O_2	10	43.50	10.158	435.0	19851.0
R	10	16.20	10.521	162.0	3620.0
OR	10	59.70	14.761	597.0	37601.0

*See Table I for explanations of variable name abbreviations.

TABLE IV

LOW ANXIOUS CONTROL GROUP
MEANS AND STANDARD DEVIATIONS FOR THE DIFFERENT VARIABLES

VAR. NAME*	N	MEAN	STD. DEV.	SUM X	SUM X^2
M	10	6.30	3.179	63.0	487.0
O_1	10	4.70	1.870	47.0	251.0
P	10	5.50	2.486	55.0	357.0
MOP	10	16.50	3.033	165.0	2805.0
MAS	10	7.00	3.139	70.0	578.0
O_2	10	44.90	11.301	449.0	21309.0
R	10	21.70	8.532	217.0	5363.0
OR	10	56.60	13.989	666.0	46116.0

*See Table I for explanations of variable name abbreviations.

TABLE V

SUMMARY OF ANALYSIS OF VARIANCE, VARIABLE OR

SOURCE OF VARIATION	SS	DF	MS	F
A (high vs. low anx)	1651.225	1	1651.225	3.411
B (Exper vs. control)	1311.025	1	1311.025	2.709
A X B	354.025	1	354.025	.731
Within Cell	17422.100	36	483.947	
Total	20738.375	39		

TABLE VI

HIGH ANXIOUS EXPERIMENTAL GROUP
CORRELATIONS AMONG VARIABLES

VARIABLE X	VARIABLE Y	N	r
M	O_2	10	-.809*
M	R	10	-.275
M	OR	10	-.759*
O_1	O_2	10	.003
O_1	R	10	-.140
O_1	OR	10	-.045
P	O_2	10	-.372
P	R	10	-.620*
P	OR	10	-.513
MOP	O_2	10	-.563*
MOP	R	10	-.375
MOP	OR	10	-.589*
MAS	O_2	10	-.355
MAS	R	10	-.029
MAS	OR	10	-.304
O_2	R	10	.382
O_2	OR	10	.951*
R	OR	10	.647*

*Significant at .05 level of confidence (Edwards, 1960.)

TABLE VII
LOW ANXIOUS EXPERIMENTAL GROUP
CORRELATIONS AMONG VARIABLES

VARIABLE X	VARIABLE Y	N	r
M	O_2	10	-.247
M	R	10	.120
M	OR	10	-.157
O_1	O_2	10	-.156
O_1	R	10	-.060
O_1	OR	10	-.221
P	O_2	10	.325
P	R	10	.223
P	OR	10	.244
MOP	O_2	10	-.064
MOP	R	10	.138
MOP	OR	10	-.082
MAS	O_2	10	-.162
MAS	R	10	.144
MAS	OR	10	-.160
O_2	R	10	.725*
O_2	OR	10	.970*
R	OR	10	.794*

*Significant at .05 level of confidence (Edwards, 1960.)

TABLE VIII

HIGH ANXIOUS CONTROL GROUP
CORRELATIONS AMONG VARIABLES

VARIABLE X	VARIABLE Y	N	r
M	O_2	10	.399
M	R	10	.269
M	OR	10	.467
O_1	O_2	10	-.710*
O_1	R	10	.114
O_1	OR	10	-.409
P	O_2	10	-.004
P	R	10	-.690*
P	OR	10	-.498
MOP	O_2	10	-.504
MOP	R	10	-.262
MOP	OR	10	-.533
MAS	O_2	10	.281
MAS	R	10	-.182
MAS	OR	10	.063
O_2	R	10	.018
O_2	OR	10	.710*
R	OR	10	.725*

*Significant at .05 level of confidence (Edwards, 1960.)

TABLE IX

LOW ANXIOUS CONTROL GROUP
CORRELATIONS AMONG VARIABLES

VARIABLE X	VARIABLE Y	N	r
M	O_2	10	.399
M	R	10	-.110
M	OR	10	.254
O_1	O_2	10	-.357
O_1	R	10	-.557*
O_1	OR	10	-.632*
P	O_2	10	.063
P	R	10	.209
P	OR	10	.175
MOP	O_2	10	.246
MOP	R	10	-.291
MOP	OR	10	.018
MAS	O_2	10	.037
MAS	R	10	-.265
MAS	OR	10	-.131
O_2	R	10	-.024
O_2	OR	10	.792*
R	OR	10	.589*

*Significant at .05 level of confidence (Edwards, 1960.)

CHAPTER V

SUMMARY AND CONCLUSIONS

It has been the purpose of this investigation to test the hypothesis that anxiety is inversely related to creativity. A number of investigators have suggested the existence of such a relationship, but to date experimental studies--as opposed to correlational ones--have been rare. In addition to empirical observations which have implied that creativity may be largely dependent upon such personality variables as anxiety and defensiveness, theoreticians have offered several plausible explanations of the relationships among these variables. Freud, for example, suggested that sublimation is the dynamic source of creativity. Later analysts have modified his approach somewhat so that adaptive regression and regression in the service of the ego have been alternatively suggested as hypothetical processes at the basis of creative performance. Other approaches, more amenable to the tastes of experimentalists, have been offered by Mednick, Guilford, and by Reigel, Reigel,

and Levine. However, it was not the purpose of this study to offer a "crucial" test of any theoretical position. Rather, the existence of a frequently noted relationship was simply to be tested by experimental rather than correlational means.

Forty subjects were selected on the basis of scores on the Nicolay-Walker Personal Reaction Schedule and divided into high and low anxious experimental and control groups. Control subjects were given Guilford's Consequences test individually and without comment by the experimenter. Experimental subjects were required to take the test under conditions of stress, with stress being defined operationally as the administration of electric shock by means of a Harvard Inductorium.

An analysis of variance failed to reveal any significant main effects or interactions across groups or treatments on the OR variable. It was pointed out that lack of significance was probably due to a small N. However, a study of the correlations among the variables within each of the groups was a good deal more productive in terms of implications for the hypothesis. Those correlations which proved significant seem especially important in view of the small N and the fact that the sample was carefully selected, thus reducing over-

all variance.

In general, when the correlations were at all significant, the anxiety scores were usually negatively correlated with creativity scores. More specifically, subjects high in type P anxiety seemed most susceptible to the disorganizing effects of the stress condition. Even in the absence of stress, however, high anxious subjects apparently suffered some impairment of performance with the demands of the task itself perhaps constituting some threat to feelings of personal adequacy.

Low anxious subjects, on the other hand, seemed to experience some facilitation in the face of a stressful condition. It seems apparent that these findings, while not conclusive by any means, are at least thought-provoking and suggestive of possibilities for theoretical speculation. For example, an examination of the correlations indicates that the performances of the various groups fit quite neatly into a Hull-Spence conceptualization. High anxiety (or drive or D) impaired performance, particularly in conjunction with stress conditions, while a low level of anxiety in conjunction with stress did not interfere with performance.

Thus, although the hypothesis must be rejected in view of the results of this study, there are also a

number of indications that further tests are warranted. In fact, it seems likely that with a larger N, there might be some convincing evidence of a negative relationship between anxiety and creativity which has only been suggested in the findings of this investigation.

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APPENDIX I

DESCRIPTION OF PRS ANXIETY TYPES*

"Type M anxiety (Motor Tension) is characterized by concern with external achievement and physical tension which acts as a defense against feelings of inadequacy. When frustration occurs, energy is channeled somatically instead of physically. Type M anxiety results in hyperactivity, physical and mental restlessness, or jumpiness. Type O anxiety is characterized by concern that external demands and perceived expectancies may be overwhelming and one may suffer harm. It represents projection or rationalization of one's possible personal inadequacy and magnification of personal problems out of proportion to objective reality. The emphasis here is on the external as a source of uncertainty or unrest. Type P anxiety is characterized by concern that one may not be capable of meeting the difficulties of life. The person himself feels inadequate and the inadequacy lies within himself. There is a certain helplessness and self-evaluation which may give rise to guilt feelings. The focus of the uncertainty is on one's own inadequacy."

*From Nicolay, Walker, and Riedel, 1966, p. 53.

APPROVAL SHEET

The thesis submitted by Joseph V. Rizzo has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

27 January 1967 Robert P. Nicolay